

FIX-N-FAX #30

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Tips on the Cooling System

To produce power, an engine must generate heat and a lot of it. However, there is a narrow temperature margin at which engines give their best performance and this margin is determined, for the most part, by the cooling system.

Most engines run best above 180° F. and, if operating temperatures are considerably higher or lower, performance will suffer. For example: an engine that is operated at temperatures lower than those recommended by the manufacturer, fuel consumption increases. This is a particular problem in short-run driving where the engine does not reach its proper operating temperature. Colder weather is another problem, but this can be solved by using temporary or thermostatically-controlled radiator closures to raise engine temperatures to normal.

Other than the temperature gauge, there are usually indications that an engine is not heating up sufficiently. The presence of fuel in the crankcase oil can mean a too-cool operating condition, because blowby of raw fuel during engine idling is accelerated when jacket temperatures are below 120 degrees F.

Another sign of low operating temperatures is excessive water in the crankcase oil. Low jacket temperatures usually mean low oil temperatures, and this accelerates formation of condensation in the crankcase.

THE HOTTER IT RUNS - THE BETTER

The hotter an engine runs, the better. Obviously, however, this means within reasonable thermal boundaries. Damage resulting from an overheated engine is apparent to any mechanic. Cracked and warped pistons, liners, cylinder heads, burnt rings and injectors, blown gaskets and on and on. It is doubtful that anything can do as much overall damage to an engine as overheating.

There are a number of reasons for overheating, but the main one is, of course, loss of coolant somewhere in the system. The majority of leaks are easiest to locate when the engine is at operating temperature. Look for "tracking" of minerals that have dried out from a small leak and trace the leak to its source. If the engine has glycol antifreeze in it, the tracking will have traces of the antifreeze's color.

The smallest leak can usually be found by applying 15 psi pressure on the system. A regular pressure tester is best, but you can make a pressure check using a pipe plug with a tire valve soldered in it. Install the plug in the thermostat housing on the engine side of the thermostat and apply pressure with short spurts of air. Be very careful, however, not to apply too much pressure because this can damage the radiator. Fifteen (15) pounds should be adequate. Inspect connections, lines, hoses, petcocks, pump connections, flange gaskets, etc., for signs of leakage.

Leakage of exhaust gases into the cooling system corrodes the system quickly, especially if the gases come in contact with antifreeze solution. Exhaust gas leakage can occur if the cylinder head is warped, if the cylinder head bolts have been torqued improperly or out of sequence, or if the head gasket is cracked or porous.

To locate exhaust gas leakage, pressurize each cylinder in turn with valves closed. As pressure is applied on a cylinder, watch the coolant for bubbles. If they appear, you've found the source of a leak.

Air leaks in a cooling system can mean a ruined water pump, because air accelerates rust in the system by as much as 300 percent. Air bubbles also have a scouring effect on water pump impellers and can ruin impeller blades.

To check for air leaks, fill the radiator to normal level, make sure all hose connections are tight, and let the engine heat to operating temperature. In place of the pressure cap, use a nonpressure cap on the radiator and put a small hose on the lower end of the overflow pipe with the other end of the hose in a jar or can of water.

WATCH FOR BUBBLES

With the truck out of gear, run the engine at fast idle. If air is being sucked into the radiator, there will be a steady stream of bubbles in the container of water.

One point however – a leaking head gasket will also create a stream of bubbles in the container. Check out the cooling system for leaks first. If none are found, check the head gasket by looking for low compression readings in adjacent cylinders, indicating leakage.

The thermostat is a prime suspect in any cooling system problem. If you have any doubts about the condition of a thermostat, it is a simple task to check it out. When a truck is first started, look at the water in the radiator. It should not be circulating. If it is, it means the thermostat is frozen in an open position. With this situation, the engine won't heat up enough, resulting in sludge and heavy carbon deposits around rings and intake valves.

Now watch the coolant for a few minutes. When the water reaches around 165 to 175 degrees F, the thermostat should begin to open, allowing circulation of the water. At approximately 180 degrees F., the thermostat should be fully open.

If the coolant does not circulate freely at that temperature, the thermostat may be stuck in a closed position. Any doubts left in your mind can easily be taken care of by removing the thermostat and checking it in a pan of heated water with a thermometer to observe opening and closing at various temperatures.

If a thermostat with a higher or lower temperature range is changed in an engine equipped with an automatic radiator shutter, the shutterstat must also be changed to the correspondingly higher or lower range to maintain engine temperature at a predetermined setting. Be sure that all vanes move freely without binding. Shutter blade pivot rod and arms should be lubricated with light engine oil. Contact the manufacturer for proper shutterstat and thermostat combinations.

A malfunctioning pressure cap is another possible trouble maker. The majority of radiators have both a pressure regulator valve and a vacuum relief valve. Repeated loss of coolant could indicate improper action of the pressure regulator valve, and collapsed hoses are a sign that the relief valve is not functioning within limits. Be sure the radiator cap is working properly and has the correct psi rating.

Every truck's radiator, water flow rates and water chamber sizes are designed so that heat can be distributed by the circulating water evenly throughout the engine. These water chamber sizes are circulated to precision size, and there is little room left for foreign particles.

With many water pumps actually pumping over 100 gallons of coolant per minute, and turning up to 5,000 rpm, it is easy to realize that the cooling system must be clean and free of rust and scale that could clog the close tolerances within the pump. The pump seal is most vulnerable to abrasive particles, requiring complete flushing of the system at time of pump installation and periodically thereafter.

Just as hazardous to a cooling system as rust and foreign particles is the coating calcium deposits that can build up inside water chambers. This calcium coating results from hard, untreated water reacting with heated metal and has a tremendous insulating capacity. Therefore, your heat indicator gauge may show the engine running cool while, in reality, heat is not being dissipated and is ruining the engine.

The radiator core should be cleaned regularly to remove leaves, bugs and dirt deposits. Wire brush it or use compressed air to dislodge hard-to-remove deposits.

One source of overheating is a layer of dirt and grime on a engine, acting as insulation and preventing dissipation of heat. Periodic cleaning of the engine will prevent this. Use a good solvent to loosen grease, dirt and rust for easy washing.

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